

Claims

1. A method of applying a conditioning effect to a material substrate, said method including the step of performing a plasma modification and/or plasma deposition treatment on the substrate, said conditioning effect comprising exposing the substrate to any, or any combination of, at least two treatment steps: (i) cross-linking of either or both the exterior and internal surfaces of the substrate; and/or (ii) plasma modification or plasma deposition of/onto the cross-linked material.
2. A method according to claim 1 wherein steps (i) and (ii) are both performed and in sequence.
3. A method according to claim 1 wherein the precursor gas used in the generation of the plasma is a noble, inert or nitrogenous gas.
4. A method according to any preceding claims wherein the coating material is modified in the form of a hydrophilic layer in the first step with the plasma treatment in the second step acting to oxidise or nitrogenate the material.
5. A method according to claim 4 wherein the precursor gas or liquid used in the plasma treatment step are oxygen or nitrogen containing chemical compounds.
6. A method according to any of the preceding claims wherein an oxidation method is used in the form of ozonolysis.
7. A method according to claim 1 wherein the precursor gas or liquid used for the plasma treatment in step 2 (ii) contains fluoride.
8. A method according to claim 1 wherein the plasma used is a non-equilibrium plasma generated by a radio frequency, microwaves and/or direct current.
9. A method according to any of the preceding claims wherein the plasma power applied during the first step is in the range of 0.01 watt to 500 watts.

10. A method according to any of the preceding claims wherein the plasma power applied during the second step is in the range of 0.01 watt to 500 watts.
11. A method according to any of the preceding claims wherein the plasma power applied during either or both of the first and second steps is pulsed.
12. A method according to any of the preceding claims wherein the precursor gas or liquid introduced during either or both the first and second steps is pulsed.
13. A method according to any of the preceding claims wherein the substrate is defined as any article capable of supporting a coating applied thereto.
14. A method according to claim 13 wherein the substrate is a porous article with an exterior surface, a bulk matrix and pores extending from the exterior surface into the bulk matrix, said bulk matrix exterior and interstitial surfaces, at least in part, polymeric or oligomeric.
15. A method according to claim 14 wherein the bulk matrix is a polyolefin.
16. A method according to Claim 15 wherein the bulk matrix has a void volume ranging from 0.01% to 99%.
17. A method according to any of the preceding claims wherein step (i) is controlled such that the effect of said step is controlled to be applied to a limited depth of the material below the external surface.
18. A method according to any of the preceding claims wherein in step (ii) the effect of said step is controlled to be applied to a limited depth into the material below the external surface of the substrate.
19. A method according to any of the preceding claims wherein the plasma used in either or both steps (i) and (ii) is selectively applied to localised areas across the substrate surface and/or below the substrate surface.
20. A method according to any of the preceding claims wherein the material is an absorbent,

hydrophobic polymer which is heated by step (i) to be cross linked by a noble gas plasma to improve its ability to retain liquid and render it superabsorbent.

21. A method according to claim 20 wherein the material is modified by a subsequent nitrogenating plasma as step (ii) to render said cross linked polymer compatible with amine functionalities to form a super-absorbent polymer capable of retaining large quantities of amine containing aqueous solutions.

22. A method according to any of the preceding claims wherein the substrate is a superabsorbent material.

23. A substrate having a modified surface, said surface modified by the method as set out in any of claims 1-22.